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Document Preparation Profile (DPP)
Version 1.0 dated [11 Nov. 2020]

1. IDENTIFICATION

Document Category or batch of publications to be revised in a concomitant manner:

Specific Safety Guide

Working ID: DS531

Proposed Title: **Geotechnical Aspects in Site Evaluation and Design of Nuclear Installations**

Proposed Action: **Revision of a publication**

“Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants”, IAEA Safety Standards Series No. NS-G-3.6 (2004)

Review Committee(s) or Group: NUSCC, WASSC

Technical Officer(s): Masato ONO (NSNI/EESS)

2. BACKGROUND

In the last few decades, seismic induced geotechnical events affected several nuclear power plants (NPPs), and countermeasures were taken in response to these incidents. In 2007, large ground settlements of the foundation induced by the Chuetsu Oki earthquake caused fire and damaged the function of the non-emergency in-house electrical transformer at the Kashiwazaki Kariwa NPP in Japan. In 2011, a landslide of the slope induced by the Tohoku earthquake fell down a transmission tower, resulting in the loss of off-site power to Units 5 and 6 of the Fukushima Daiichi NPP in Japan. In addition, some countries embarking on nuclear power selected sites that required soil substitutions. Unfavourable soil displacement due to climate change is being reported in areas with permafrost soils.

IAEA Safety Standards Series No. NS-G-3.6, Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants was published in 2004 to provide recommendations on dealing with geotechnical engineering aspects of the safety of nuclear power plants. In particular, it provided recommendations on meeting the requirements of IAEA Safety Standards Series No. NS-R-3, Site Evaluation for Nuclear Installations”, published in 2003, and revised by amendment and republished as NS-R-3 (Rev. 1) in 2016. NS-R-3 (Rev. 1) was superseded by IAEA Safety Standards Series No. SSR-1, Site Evaluation for Nuclear Installations in 2019, where the input to safety assessment is highlighted.

This revised Safety Guide will enhance and supersede NS-G-3.6 by incorporating the latest knowledge and experiences from Member States and lessons learned from geotechnical events, and expand the scope from NPPs to all types of nuclear installation using a graded approach.

3. JUSTIFICATION FOR THE PRODUCTION OF THE PUBLICATION

The revised Safety Guide will directly support Requirement 21 (paras 5.24-5.26) and Requirement 22 (paras 5.27-5.31) of SSR-1, as well as Requirement 17 (paras 5.15A-5.17, 5.19-5.21A) and Requirement 18 (para 5.23) of SSR-2/1 (Rev. 1).

The current Safety Guide NS-G-3.6 issued in 2004 needs an update to address the following aspects:

- Revision of the applicable safety requirements in SSR-1, SSR-2/1 (Rev. 1), SSR-3, SSR-4, GSR Part 2;
- Consideration of lessons learned from recent geotechnical related events;
- Filling the gap between the existing publication and the state-of-the-art practice in Member States, taking feedback from existing operating experience, technical safety review services and advisory services into account;
- Evolution of the approach, methodology and techniques to assess the geotechnical aspects of nuclear installations.

Furthermore, the terminology needs to be revised and made consistent with the new definitions in the Safety Requirements publications and the IAEA Safety Glossary (2018 Edition).

4. OBJECTIVE

The main objective of the revised Safety Guide is to provide recommendations on how to meet the applicable requirements from SSR-1, SSR-2/1 (Rev. 1), SSR-3, SSR-4 and GSR Part 2, related to geotechnical aspects for nuclear installations. The second objective is to align the guidance to the current international state of practice in Member States, such as the following:

- Methodologies on considering phenomena such as heave and slope failure;
- Improved calculation methods for assessment of liquefaction hazard and soil-structure interaction;
- Considerations for specific sites located on soft soil at the waterfront;
- Methods for soil replacement in the case of unfavourable soil condition.

5. SCOPE

The scope of the revised Safety Guide will cover all types of nuclear installation as defined in the IAEA Safety Glossary (2018 Edition). It will be applicable to both existing and new installations, including small modular reactors. It will cover geotechnical engineering aspects that are important for the safety of nuclear installations. Although seismic aspects play an important role in this field, seismic aspects other than geotechnical aspects will be out of the scope of the revised Safety Guide and are covered by DS507.

6. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

The proposed Safety Guide falls within the thematic area of safety evaluation and will interface with at least the following IAEA Safety Standards Series publications (this is not, and cannot be, regarded as an exclusive or exhaustive list):

- SSR-1, Site Evaluation for Nuclear Installations (2019)
- SSR-2/1 (Rev. 1), Safety of Nuclear Power Plants: Design (2016)
- SSR-3, Safety of Research Reactors (2016)
- SSR-4, Safety of Nuclear Fuel Cycle Facilities (2017)
- GSR Part 2, Leadership and Management for Safety (2016)
- DS507, Seismic Hazards in Site Evaluation for Nuclear Installations (revision of SSG-9)
- DS490, Seismic Design of Nuclear Installations (revision of NS-G-1.6)
- DS498, Design of Nuclear Installations against External Events Excluding Earthquakes (revision of NS-G-1.5)
- DS529, Investigation of Site Characteristics and Evaluation of Radiation Risks to the Public and the Environment in Site Evaluation for Nuclear Installations (revision of NS-G-3.2)
- SSG-18, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (2011)
- SSG-53, Design of the Reactor Containment and Associated Systems for Nuclear Power Plants (2019)

7. OVERVIEW

The planned table of contents includes the following sections:

1. Introduction
2. Site investigation for nuclear installations regarding geotechnical aspects
3. Site considerations for nuclear installations regarding geotechnical aspects
4. Considerations for the foundations of nuclear installations regarding geotechnical aspects
5. Geotechnical related design of construction
6. Geotechnical assessment of soil stability and design of prevention measures
7. Monitoring of geotechnical parameters
8. Geotechnical aspects in site evaluation and design of nuclear installations other than nuclear power plants
9. Application of the management system regarding geotechnical aspects

References

8. PRODUCTION SCHEDULE:

Provisional schedule for preparation of the document, outlining realistic expected dates for each step

STEP 1: Preparing a DPP	DONE
STEP 2: Internal review of the DPP (Approval by the Coordination Committee)	November 2020
STEP 3: Review of the DPP by the review Committee(s) (Approval by review Committee(s))	June 2021
STEP 4: Review of the DPP by the CSS (approval by CSS) or information of the CSS on the DPP	November 2021
STEP 5: Preparing the draft publication	TM October 2021 Complete Final Draft 4Q 2021
STEP 6: First internal review of the draft publication (Approval by the Coordination Committee)	4Q 2021
STEP 7: First review of the draft publication by the review Committee(s) (Approval for submission to Member States for comments)	2Q 2022
STEP 8: Soliciting comments by Member States	3Q 2022
STEP 9: Addressing comments by Member States	4Q 2022
STEP 10: Second internal review of the draft publication (Approval by the Coordination Committee)	1Q 2023
STEP 11: Second review of the draft publication by the review Committee(s) (Approval of the draft)	2Q 2023
STEP 12: (For Safety Standards) Editing of the draft publication in MTCO and endorsement of the draft publication by the CSS (For nuclear security guidance) DDG's decision on whether additional consultation is needed, establishment by the Publications Committee and editing	4Q 2023
STEP 13: Approval by the Board of Governors (for SF and SR only)	N/A
STEP 14: Target publication date	2Q 2024

9. RESOURCES

20 staff-weeks of professional staff plus 80,000 Euro for a Technical Meeting and consultancy meetings.